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among men who have been here ten or more years, from the opinion that these old men are typical of their generation, and that the tendency of the younger is steadily downward. This opinion seems to me to be so well grounded that it would be but flippancy to suggest that this admiration of the departed generation is caused mostly by the glamour that usually surround the "good old days," "the Golden Age."

CHARACTERISTICS OF AMERICAN RAILWAY TRAFFIC: A STUDY IN TRANSPORTATION GEOGRAPHY.

BY

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The freight traffic of American railways far exceeds the tonnage handled by the railroads in any other country; indeed, the demand for transportation has been so great and the needs have been so fully met in the United States that the line mileage of our railways is greater by fifteen per cent. than the mileage of all Europe and comprises two-fifths of the railway net of the entire world. The density of traffic, naturally, varies with different sections of the country, and travel and tonnage are light in the sparsely settled sections; but the economic activity is such that the railways in the United States are burdened with nearly twice as many tons as are shipped in Great Britain, with double the tonnage dispatched in Germany, and with five or six times the weight of cargo shipped in France.

This comparison, favourable as it is, does not do full justice to American railways, because it does not take into account the relative distances freight moves in the four countries. The areas of primary production are so widely separated from the manufacturing centers in the United States, the farm and the factories are so far removed from the large markets in and through which goods reach consumers, that freight must be carried long distances. Two hundred and forty miles is the average length of haul for a ton of freight in the United States, while in the compact countries of Great Britain, France and Germany the average distance travelled by a ton of freight is less than one-third that number of miles.

The unit to be used in comparing the total freight services of one railway system with those of another, or of the railroads of different countries, is the freight ton-mile—one ton of freight moved one mile. The freight ton-mileage, the tons shipped multiplied by the number

of miles carried—236,600,000,000 ton miles in 1907—was roundly nine times that of the German railways and twenty times the figures for France. The ton-mileage of the traffic on the British railways is not known, but it is apparently about one-sixth that of the American railroads.

Figures, such as the foregoing, as to total length of line and aggregate ton-mileage, give but partial information either regarding the kind of railroad systems in use in the United States and other countries, or concerning the traffic services performed by the railways. The line may have from one to four tracks; the roadbed structures and equipment may be of various degrees of efficiency. A "mile of railroad" is an indefinite term that means little until it has been described. Likewise, figures for ton-mileage measure dissimilar services when applied to the rail traffic in different countries or to the traffic of particular railroads within a country of continental proportions, such as the United States possesses.

The services of American railways—the volume and nature of their traffic—are determined by two classes of factors: those affecting both freight and passenger transportation in general, and those special factors that apply to only one of the two branches of the railroad business. To understand American railway traffic and the rates and fares charged therefor, and to make accurate comparisons either between railroads in different sections of the United States or between the lines in our country and abroad, these general and special factors must be kept in mind and given due weight.

The size, topography, and climate of the United States impose controlling conditions upon transportation. The railroad system adapted to the needs of a small insular country such as Great Britain or Japan or to the territory of a small portion of Europe, such as France or even Germany, will necessarily be unlike the system required in the United States, having absolute freedom of trade and traffic movement over an area equal to that of all Europe. If traffic be carried tens or hundreds of miles, as in most parts of Europe, it will be handled in relatively small units with an equipment adapted thereto; but, if the distances to be covered are hundreds or thousands of miles, as is true of passenger travel and of the shipments of foods, materials and manufactures within, out of or into the United States, economy requires that each car, train and locomotive shall move a relatively large number of passengers or of tons of freight. The mere size of the United States in part explains some of the obvious differences between the traffic methods of European and American railroads.

Topography is a physical factor hardly less influential than distance. The fact that the territory within the United States includes two relatively narrow seaboard areas separated by the Appalachian and Cordilleran ranges from the broad valley drained by the Mississippi River and its tributaries and composed of prairies and gently rolling lands has, from the beginning of railroad transportation in this country, strongly influenced the character of construction, the kind of equipment used and the methods of handling traffic. The effects of topography have been especially great, because the mountain uplifts lie athwart the routes of heaviest traffic, which in the United States run east and west connecting our populous and manufacturing Eastern States with the Mississippi Valley, from whose rich stores of mineral wealth and from whose fertile farms a return tide of traffic streams eastward over the Alleghanies to the mills and markets of both Atlantic America and of Europe, while the same great central basin of our country carries on a growing volume of commerce that moves westward and eastward to and from our great West and the far Orient. The majority of the great trunk lines of American railroads follow the parallels of latitude, in spite of the fortunate fact that the rapid progress of the southern and southwestern sections of the country is steadily swelling the volume of north and south traffic and increasing the importance of the roads that run with the lines of longitude and do not have mountains to overcome. In general, it has been and still is true that in the United States the railroads must carry traffic long distances, and must haul a relatively large share of their tonnage over mountain grades.

In Europe, the relation of traffic currents to topography, though somewhat complex, is, broadly speaking, the opposite of the relation in the United States; because the Alps have a general east and west trend. The great plain of Europe lies north of this continental divide, and extends, with broadening area, eastward from the great seaports and industrial centers of western Europe into which the major traffic routes converge. The countries about the Mediterranean constitute another important, though secondary, traffic area. Fortunately for Europe only a comparatively small volume of heavy freight need be shipped by rail between the northern and southern traffic districts. The trans-Alpine railroads handle mainly passengers, mail, express and light freight.

The climatic conditions prevailing in a country and in different sections of a country, as the result of topography and other geographic factors, establish a third physical control over the location and the traffic of railroads. It is climate, particularly rainfall, that

sets the sharpest limits to production and population. The only resources of arid lands are their minerals and they can be made available only to the extent that a mining population can be provided from other sections with food and water.

The United States has been so generously supplied with water resources that the entire three-fifths of the country lying east of the Rocky Mountains, with the exception of a part of the strip between the mountains and the 100th meridian, is productive and everywhere habitable. In the Pacific Coast States, the rains reach to the Sierra Nevada and Cascade mountains, upon whose spacious roof heavy winter snows linger late into the spring to nourish the streams during the summer months, that their waters may furnish power the year around and serve for irrigation when crops are growing. Over most of the broad Cordilleran highland the rainfall is so light that only limited areas can be successfully farmed. Irrigation is adding small, though highly productive, areas to tillage; but the climate is such that the mines, which are many and rich, and the ranches, which in the northern half of the Cordilleran region are numerous and broad, furnish the population with its chief industrial supports. Agriculture and general manufactures can never become extensive in the western plateau.

The United States, indeed, has a wide range of climate. The East, the South, the central West, the mountain section and the Pacific slope—each section has its own climate and its consequent industries. Each has its special transportation needs that have caused the characteristics of the traffic services of American railroads to vary with different parts of the country.

Another general determinant of the character of railroad traffic, both freight and passenger, is the stage the country has reached in economic and social development,—its state of civilization. The higher the degree of civilization the greater the demand for transportation. The working of this law is particularly noticeable in the passenger travel, the number of trips per person being highest in such countries as Great Britain, Belgium, Switzerland, Germany, France and the United States, whose inhabitants travel for social and cultural as well as economic reasons. It hardly need be said that cultural conditions are only one factor affecting the volume of travel and that the countries just named do not necessarily rank as above listed in the degree of their civilization, although they are cited in the order of average per capita trips per annum.

Most persons travel for business reasons, and business conditions mainly determine the amount of travelling done, but in all countries

there is an increasing volume of travel for education, recreation, and other non-economic motives. In the smaller countries of Europe, where distances are short and the cultural inducements to travel are strong, cheap railway transportation has caused a rapidly rising percentage of the population to gratify their travel longings. In the United States, as a whole, the effect of cultural influences upon passenger traffic, while prominent, has been less marked than in several other countries, both because our long distances are a powerful deterrent to travel and for the reason that our land, though rich in scenic beauty, is still too young to abound in historic shrines and monuments of art.

That freight tonnage, as well as passenger travel, is greater *per capita* the higher the stage of civilization, and rises with the social and industrial progress of every country is a general law well illustrated by traffic conditions in eastern and southeastern Europe, as contrasted with those prevailing in western Europe, where civilization has reached a higher stage. This law expresses a fundamental and significant fact. Civilization results from the growth of human wants, which not only increase but become more complex as civilization advances. New industries arise to satisfy the enlarging demands of the individual and society, the processes of manufacture are subdivided, there is a greater territorial subdivision in production, and from all this results an increase in freight traffic far exceeding the rate of growth in population. Thus among the general conditions affecting the volume and character of the present and future freight traffic of American railroads is the degree of civilization now attained in this country and the rate at which it is advancing. Such an influence as this is manifestly not a factor whose effect can be definitely measured, but a knowledge of its presence may help to explain the distinctive features of the freight traffic of our railroads.

In contrast with these general factors, physical and social, affecting the characteristics of both the freight and passenger services, are certain special factors influencing the freight traffic and others that apply to passenger transportation.

The volume and nature of the freight handled by the railroads of any country or section of a country is determined primarily by the industries. Transportation is the servant of industry. The character of the country's products, whether they be of agriculture, of mines, or of forests, the location of the centers of manufacturing, whether they be close to or remote from the sources of materials and the markets and centers of distribution, the extent to which the

leading industries have been developed, these and all the many conditions determining what kinds of business shall be carried on and influencing their extent and territorial distribution decide what freight services the railroads shall perform.

A study of the sources of freight traffic in the United States, which will be made in the following paper,* will reveal the nature of American industries in some detail and indicate the nature of the rail transportation services they require. Here it need only be said, in passing, that nowhere else in the world do the industries require the handling of heavy materials as long distances as they are transported in the United States; and yet, despite this fact, there is an exceptionally high degree of integration of industry and of territorial specialization in production. In other words, the American railways have fully met the conditions imposed upon them by the industries they serve.

The extent to which inland and coastal waterways are used must influence the volume and kind of freight carried by the railroads. For Japan and the United Kingdom the surrounding ocean provides a cheap highway that can be readily taken by much traffic that must move by rail in most countries. In Germany, the ton-mileage of the traffic carried on the rivers and canals equals one-third the ton-mileage of the rail freight; and in France the ratio of water-borne traffic to the rail ton-mileage is even higher. The more waterways are used the lower will be the percentage which minerals and other bulky commodities comprise of the total traffic of the railroads. In the United States, minerals account for an exceptionally large share—53 per cent.—of the total rail tonnage, partly because, with the exception of the Great Lakes, the Ohio River, and a portion of the North Atlantic seaboard, the waterways are little used for transporting the products of our mines. Should the United States improve and extend its inland waterways, as is expected will be done, the traffic of our railroads will consist more largely of the classified or higher grade freight and relatively less of “commodity” or bulk traffic.

Another special factor, which has had much influence upon the freight traffic services desired of railroads, is the business habits of the people. The inhabitants of different countries and, to some extent, the residents of separated parts of the same country, have various ways of conducting their affairs. The Japanese, the Dutch, the English, the Americans, each have their accustomed business methods as farmers, merchants and manufacturers; and the rail-

* This paper will be printed in a later number of the *Bulletin*.

roads must do the work of transportation in conformity with the requirements of industry as carried on in each country; just as the railways in the United States must serve the Yankee farmer and trader, the Southern planter, the Western ranchman, and the lumberman of the Northwest. In spite of all that has been done to standardize railway methods in this country, the wide diversity in our industries and in our ways of doing things produces numerous variants in railway practice. Services conform in general to differences in business needs.

Of the special factors affecting the volume of passenger traffic of railways, sparseness or density of population is the most controlling. An agricultural section or a region rich in bulky minerals, although containing but a small population, may furnish a large freight tonnage, but travel will be light. As population increases passenger traffic expands, and at a more than proportional rate. In closely settled sections, the trips *per capita* are greater than in regions having fewer persons to the square mile. Various reasons account for this. The number of trips taken would, other things being equal, naturally be in inverse ratio to the difficulties to be overcome. Long distances deter people from travel; long journeys are expensive, time-consuming and wearisome. Short distances from city to city, or from city to mountains or seashore, are a lure to travel; fares are cheap and the trip is a pleasure. Men do business by making a personal call instead of by mail; and they relieve the monotony or lighten the drudgery of life by more frequent week-end or holiday trips. The fact that England and Belgium outrank the United States in the average number of journeys taken per inhabitant is easily accounted for by the density of the population living within their small areas.

In spite of the limitations which long distances place upon the number of trips taken, the average distance travelled by the American is exceeded only, and that slightly, by the average for the people of Great Britain. This is doubtless due in part to the relatively high average income of the people of the United States, a fact that has had much influence upon the policy followed by American railway companies in developing their passenger services. While European railways have sought to get the masses to travel by offering them, for low fares, third-class accommodations without luxuries, and a fourth class with few comforts and little speed, the American railway policy has been to continue to offer only the "first class" to the rank and file, and the railroads have striven to increase travel rather by making the services more attractive than by making them:

cheap. The European roads have found a large demand for the cheaper, though inferior grades of service, nine-tenths of the travel being in classes below the second.

The subdivision of passenger traffic in Europe into several grades is frequently said to be the result of social stratification and the existence of class feeling; whereas, it is contended that Americans are more democratic in their feelings and are not influenced by class distinctions. Possibly this may be a partial explanation of the difference between the policies of European and American railroads as to the classification of traffic, but it is probable that the low average income of the industrial classes in Europe has been the chief reason for the development of the third- and fourth-class passenger services. The cause has been more economic than social. In the United States, moreover, it seems that the traditional policy is gradually changing with the steady growth of "Pullman" services, and of the patronage of extra-fare trains whereby passenger traffic is coming more and more to consist of two classes: one provided by the "first" class day coach patronized by those who desire to travel cheaply, and the other provided by the "parlor" coaches and extra-fare trains used by those who place comfort and speed above economy. It remains to be seen whether the demand for cheap transportation in America will cause our railroads to break up the present "first" class into two grades, and thus virtually introduce the European third-class service. The ultimate adoption of such a policy does not seem improbable.

Among the many minor factors that account for the volume of travel in any country is the strength of the desire of the people for outdoor life. Some people, though they live mainly in the cities, are content to pass most of their leisure as well as their working hours indoors, while to others the appeal of the outdoor world is irresistible. The Germans, for instance, still have the instincts of their ancestors; they still love to have the trees about them and the open sky above; and, now that such a large part of them are obliged to live in cities, they satisfy their longings for the open by frequent railway excursions to the suburbs, to the country, to the mountains and the sea. Railway travel in every country, and particularly among a nature-loving people, tends to grow with increasing rapidity as people change from rural to city life.

The freight traffic of American railroads, as the result of the general and special factors that have been considered, has several clearly marked characteristics which may be briefly summarized:

1. The tonnage consists mainly of bulk traffic; minerals contributing 53 per cent., forest products $11\frac{1}{4}$ per cent., and agriculture

8½ per cent. ; while in addition to these three groups of commodities, which comprise nearly three-fourths of the total tonnage and which are mainly handled in bulk, manufactures, a large part of which consist of heavy articles shipped in car-load or train-load units, contribute about 15 per cent. of the aggregate. It is safe to say that not less than four-fifths of the freight traffic of our railroads is shipped in bulk in car-load and train-load lots.

2. The fact that these bulky commodities are transported long distances, much farther than in European countries, strengthens the tendency to use large cars and to haul heavy train-loads. Nearly two-thirds of the freight cars owned by American railway companies are of from 60,000 to 80,000 pounds capacity, eleven per cent. are in the 100,000 pounds class, and less than two per cent. are built to carry less than 40,000 pounds. Formerly the standard freight car in America had a capacity of 40,000 pounds, but now such cars include only 13 per cent. of the total number and less than 9 per cent. of the total capacity of our freight equipment. Moreover, cars belonging to shippers and private car lines and which are not included in the figures upon which these percentages are based, are of more than average size.

The contrast between American and European practice as regards size of freight equipment used, is most striking. Our small car of 20 tons (40,000 pounds) capacity is the size of their largest mineral car; and "wagons" of that capacity are in small demand. For ordinary freight in Europe a ten-ton "truck" is amply large, and coal, iron ore, and other heavy bulk traffic are regularly carried in fifteen and twenty-ton cars. The demand of the average European shipper and buyer is for frequent transportation in small units, rather than for a large and infrequent service. The organization of business in Europe is different from its organization in the United States, and the railroads in each section of the world conform to business requirements.

3. The heavy average freight train-load in the United States—350 tons, three and four times that prevailing in the leading countries of Europe—results naturally from the bulky character of the traffic, from the use of large cars, and from the long distances freight moves. This method of handling freight in large quantities also fits into the prevailing methods of doing several branches of business in this country, where it has been, and to a large extent still is, customary for manufacturers, dealers and merchants to place larger orders than is the practice with European business men. In the United States many, if not most, large buyers seek to secure com-

modities at low prices and to save on freight rates by laying in a stock that will last some time; although, by so doing, storage facilities must be provided; but in European countries, at least in those with which comparisons have been made in the preceding paragraphs, the object of the business man is to tie up only a small amount of capital in his stock, and to minimize warehousing expenses. To accomplish these ends, he is willing to pay the higher freight rates which the railroads are obliged to charge for delivering goods in small quantities and for performing their frequent services with promptness and reliable certainty.

4. The large average train-load in the United States, furthermore, is in part the result of the fact that there is not only a large-scale production, but a union, in several instances, under one management of the business of securing, by mining or otherwise, the raw materials, of transporting the materials of manufacturing, and, to some though a less extent, of distributing the finished products. Iron ore is handled from mine to lake pier, and from lake port to furnaces in train loads of 2,000 to 4,000 tons; coal is shipped from mine to yard or port in long trains of fifty-five ton cars; and petroleum, though most of the crude oil now moves unseen through underground pipes, still adds its tank cars in part train- or whole train-loads to the traffic of the railroads.

5. To the two causes just cited to account for the large train-load in the United States there should be added the third and equally evident fact that in our wide-reaching country, with its vast and varied productive output, products such as grain, live stock and cotton are brought together in great primary markets, like Chicago, Kansas City, Atlanta and many others, the traffic pouring into those reservoirs in streams, sometimes large and sometime small, but flowing out in enlarged channels to domestic centers of distribution, from which consumers are supplied, or to the seaboard exits of our exports. Trains loaded with cotton, grain, or refrigerated provisions move from the interior to the seaboard; likewise train-loads of our fruits travel from Florida or California to New England, while tropical fruit trains are run from New Orleans and the north Atlantic ports to the interior of the country.

The traffic conditions, here briefly stated, determine what the character of the freight service of American railroads must be and establish the principles controlling rate making. American railways are compelled to render services unlike those demanded of European roads, and the rates charged for those services must not only average low, but must be so adjusted as to permit and facilitate a traffic

intercourse of large volume between places separated by continental distances. Rate making must harmonize with services to be performed.

The passenger traffic of our railroads is characterized:

1. By the absence of the definite division of the service into three or four classes, as is the practice in Europe. The chief reasons for this difference are, however, to be sought in economic conditions that must change with the growing density of population in the United States. It seems probable that American and European practice as regards the classification of passenger traffic will differ less as the economic and social conditions in the United States approximate those in Europe.

2. The general ideal, to which American passenger traffic managers adhere, of a service of maximum speed and comfort (unfortunately, maximum safety of travel has not been such a definite part of the ideal), while resulting in a standard of excellence of which there is much reason to be proud, has not permitted our railroads to cater to the masses of the people by offering them a cheap service—regular and frequent, though slow, and not in anywise luxurious—such as is provided by the third and, to some extent, in the fourth class in Europe. Until an inexpensive service, such as this is regularly offered on all the ordinary passenger trains, with the exception of the express and extra-fare trains, it does not seem reasonable to expect the large expansion in traffic that can come only with the greater use of our railroads by the wage-earners and other persons of small income. To socialize passenger travel, this cheap service is required.

3. The United States, as a whole, being relatively sparsely populated, as compared with European countries, and the average distance between towns and cities being long, the passenger traffic of American railroads, though large in the aggregate, is spread over such an extensive line mileage that the density of traffic, as measured in the number of passenger-miles per mile of road, is much lower than in several other countries. In France, the railroads have a density of passenger traffic nearly three times, and in Germany almost four times, as great as our lines have; while a comparison with Great Britain, if the necessary figures were to be had, would show a still higher ratio against our railroads. When one considers that only one-fifth of the total earnings of American railroads is derived from fares and that only one-fourth of the revenues is secured from the operation of passenger trains—from passengers, mail and express—it is evident that the passenger service in this

country is still relatively undeveloped, and that its future growth offers the possibility of a large increase in the traffic and profits of the railways in the United States.

4. That the average length of the passenger journey should be greater in the United States than in more thickly settled countries is to be expected—it is more than double the average trip in Germany and about one and four-fifths the average for France—but that the length of journey, despite our growing density of population, should have increased twenty-four per cent. during the past decade, while the average in France and Germany has remained practically stationary, is a less obvious fact. The explanation lies in the large development of electric railways in the United States and the transfer from the steam railroads to the electric lines of a large share of the short-distance suburban and interurban traffic. In Europe there has as yet been but a small mileage of electric railways constructed, and the steam roads still handle such a large volume of short-trip traffic as to keep the average length of journey at a low point.

Passenger fares, as well as freight rates, are the product of traffic conditions, and of the methods followed in performing the services rendered to meet those conditions. The relative sparseness of population in the United States, with the consequent low density of passenger traffic per mile of railroad, the policy of not dividing the services into classes but of providing all or the great majority of travellers with speed and luxury as well as comfort, and the necessity our steam railroads have of sharing much of the short distance traffic with the electric lines, cause passenger fares to average higher in the United States than they do in several foreign countries. For services of the highest grade, our railroads have as low fares as are to be found abroad, and probably our best services excel those in other countries; but our neglect to provide facilities for cheap and slow travel results in relatively high average fares.

The freight and passenger services of American railways are characterized by a high degree of efficiency. The development of railroad transportation in the United States, shaped by economic needs and social conditions, has not only kept pace with the progress of the country, but has done much to make possible the nation's marvelous advance. In the freight service the accomplishments of inventive and administrative genius have possibly been more notable than in the transportation of passengers; but in both departments there has been a most successful adaptation of means to ends.